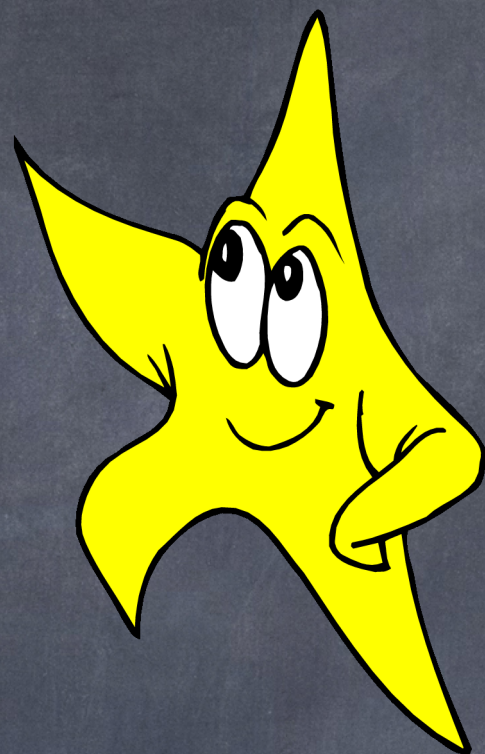


EVOLUTION



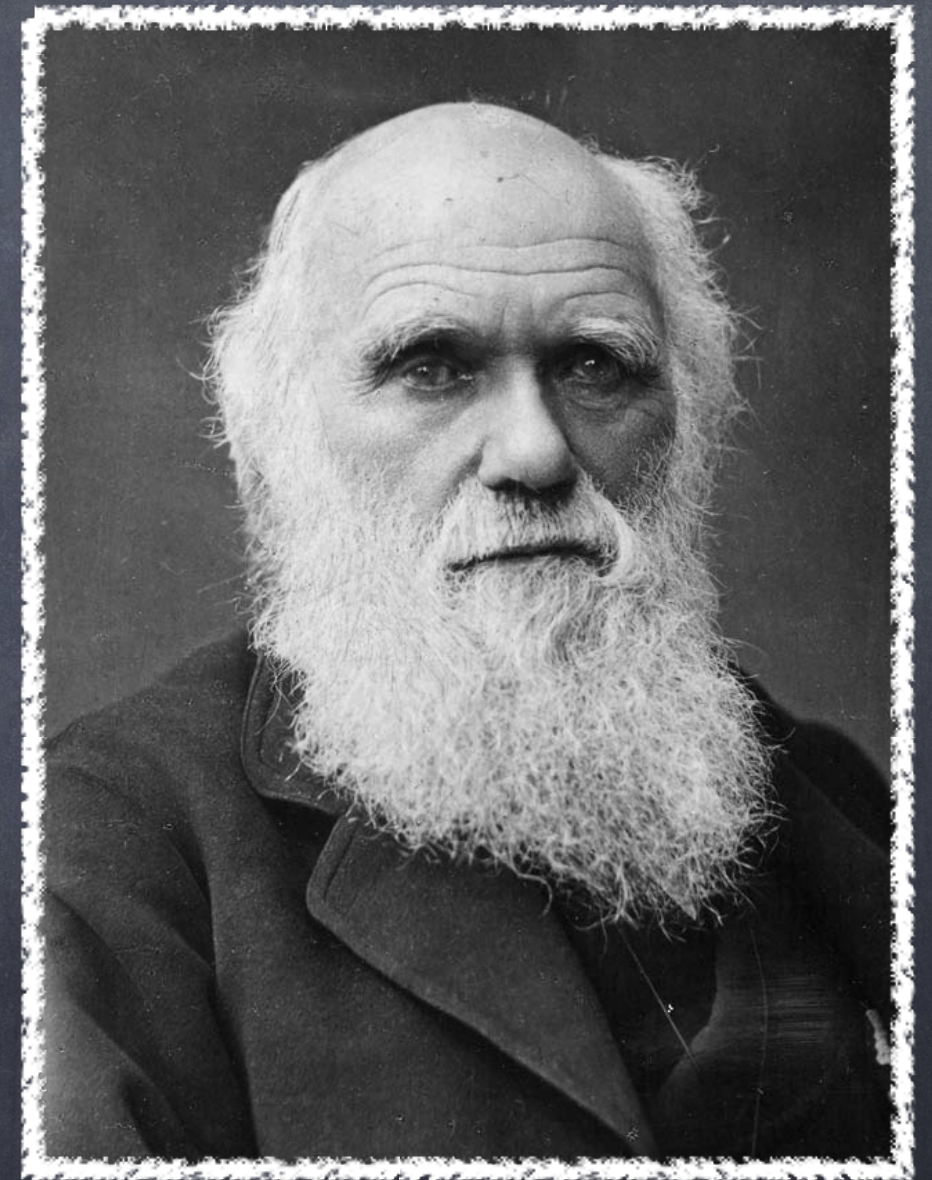
IF YOU SEE ME APPEAR ON
THE SLIDE...

COPY NOTES FROM THE SLIDE!

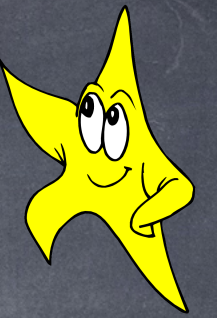
THE IDEA OF EVOLUTION

• Charles Darwin

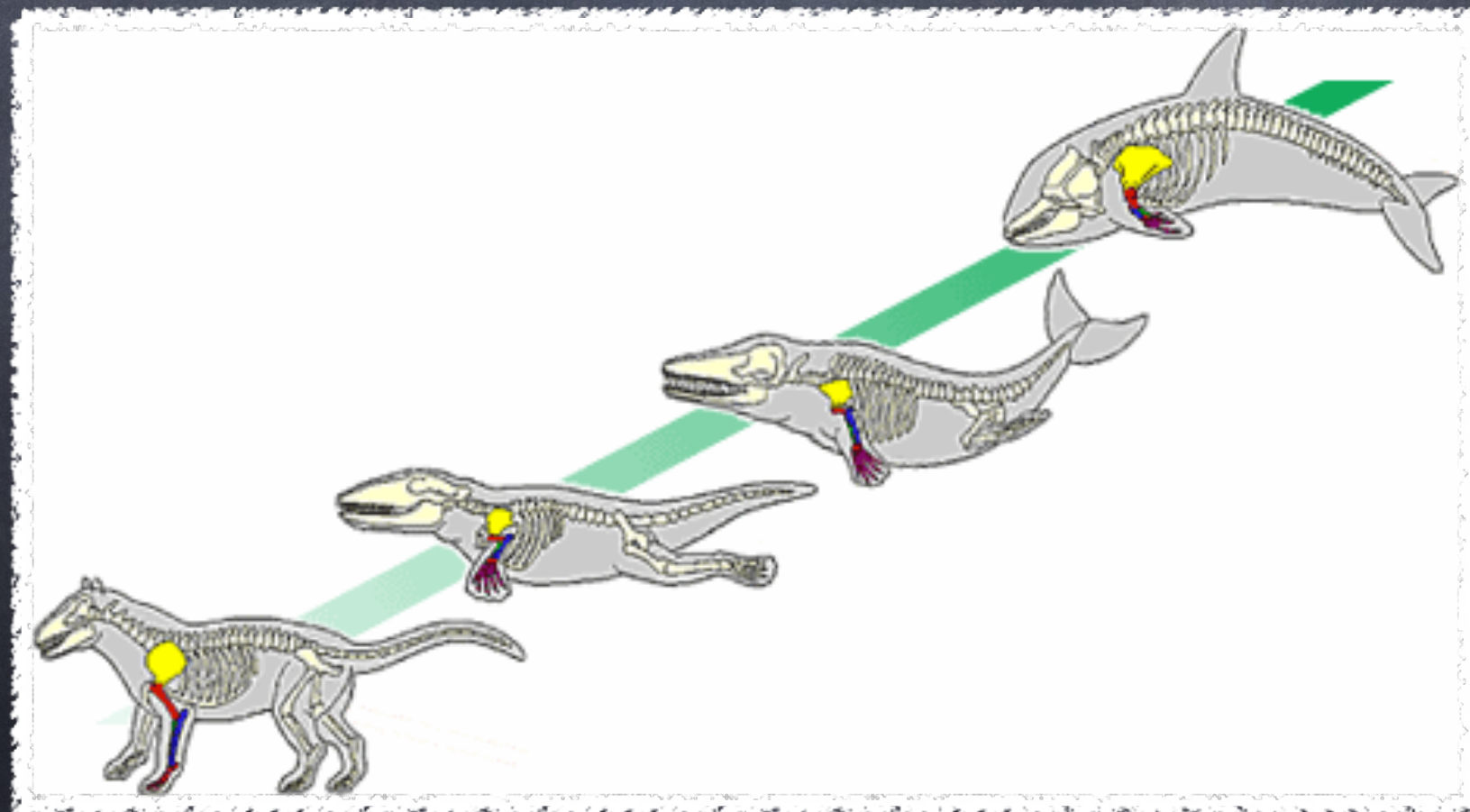
- Five year voyage to the Galápagos Islands
- Noted similarities and differences among species
- Wrote: Origin of Species



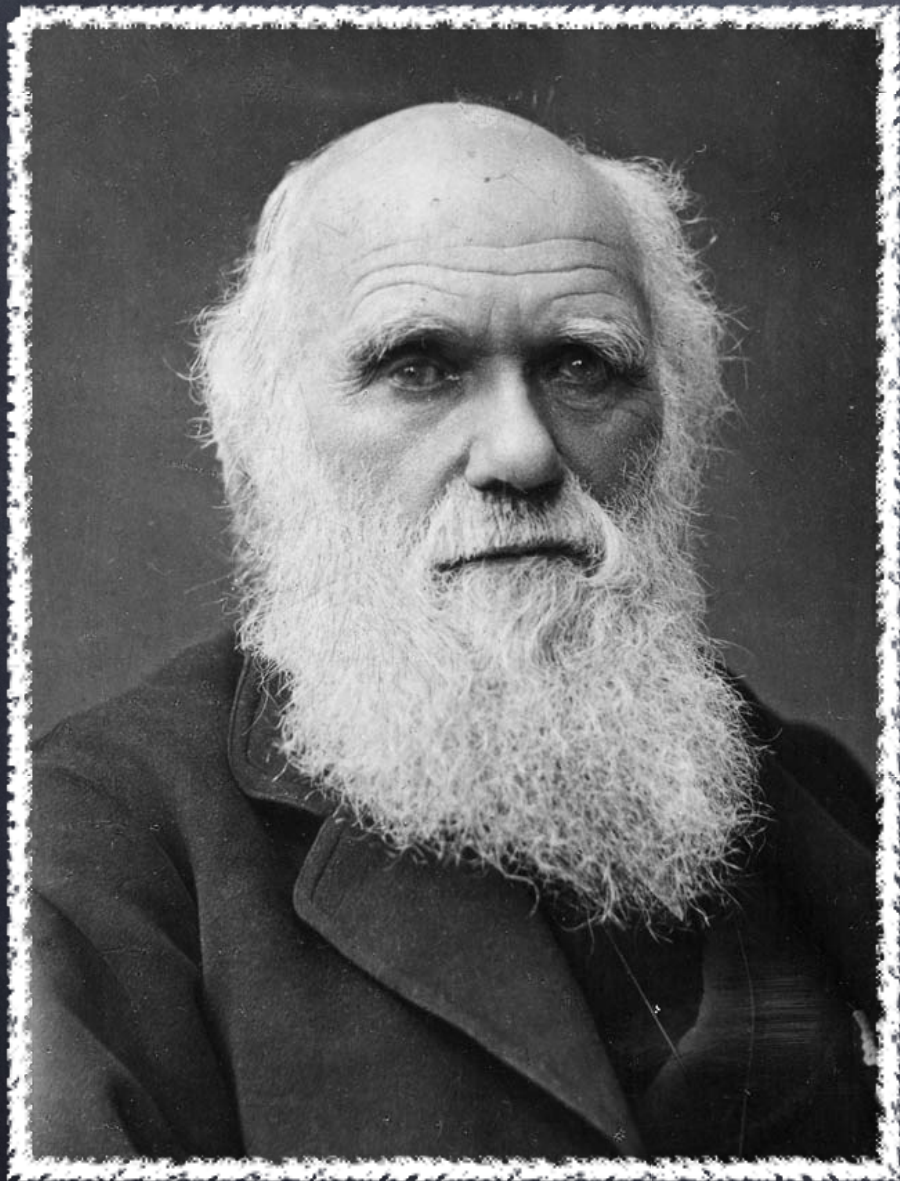
EVOLUTION



- The development of new types of organisms from preexisting types of organisms over time is called evolution.



IDEAS OF DARWIN'S TIME



- ◉ Initially, most scientists thought all species were permanent and unchanging
- ◉ Scientists then presented evidence that species on Earth have changed over time



IDEAS ABOUT GEOLOGY

- Scientists began to study rock layers, called **strata**.
- Strata are formed as new layers of rock are deposited over time
- Different rock strata contain different fossils of different kinds of organisms



GEORGES CUVIER



- French anatomist
- He spent years reconstructing the appearance of organisms' fossil bones
- Discovered that deeper and older strata hold fossils that differ from today's species

CATASTROPHISM



- ◉ Promoted by Cuvier
- ◉ This is the idea that sudden geologic catastrophes caused extinction of large groups of organisms at certain points in time

UNIFORMITARIANISM

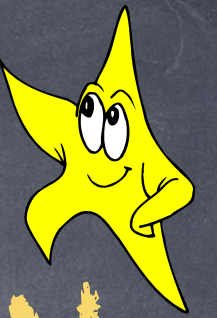


- Charles Lyell
- The same natural laws and processes that operate in the universe now, have always operated in the universe

INHERITANCE OF ACQUIRED CHARACTERISTICS

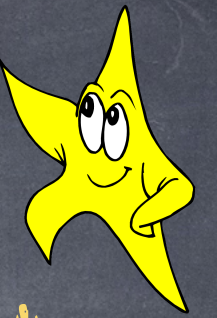
- Jean Baptiste Lamarck
- Proposed that individuals could acquire traits during their lifetime as a result of behavior, and could pass on those traits





DECENT WITH MODIFICATION

- Implies every species must have descended by reproduction from preexisting species, and that species must change over time



NATURAL SELECTION

- The process by which species that are better adapted to their environment survive and reproduce more successfully than less adapted species
- Natural selection works on populations, NOT individuals
- Individuals do not adapt, populations adapt over time

NATURAL SELECTION BIRDS



The akiapola'au
forages for insects,
often under bark



The iiwi
feeds on nectar
from ohia flowers



The 'Apapane
feeds on insects
and ohia nectar



The Maui parrotbill
tears back bark in
search of beetles



The original species,
now extinct,
probably ate
insects and nectar



The Nihoa finch
uses its heavy bill
to crush seeds



The Amakihi
is a nectar-feeder,
like the iiwi

NATURAL SELECTION

• Four main parts:

- Overproduction
- Genetic Variation
- Struggle to Survive
- Differential Reproduction

OVERPRODUCTION



- More offspring can be produced than can survive to maturity

The Theory of Evolution by Natural Selection

1 Overproduction

Every species tends to produce more individuals than can survive to maturity.



2 Variation

The individuals of a population have many characteristics that differ.



3 Selection

Some individuals survive longer and reproduce more than others do.



4 Adaptation The traits of those individuals that survive and reproduce will become more common in a population.



GENETIC VARIATION

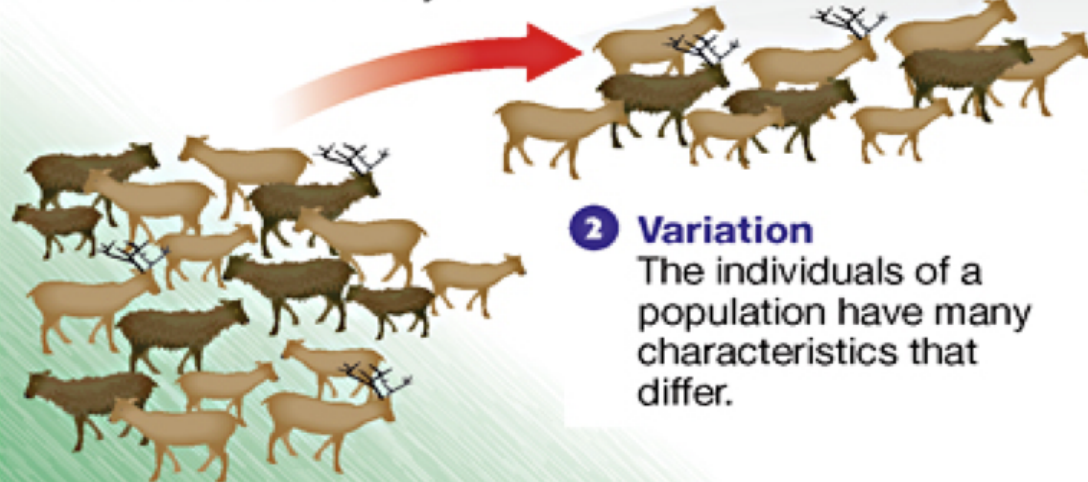


- Within a population, individuals have different traits.

The Theory of Evolution by Natural Selection

1 Overproduction

Every species tends to produce more individuals than can survive to maturity.



2 Variation

The individuals of a population have many characteristics that differ.



3 Selection

Some individuals survive longer and reproduce more than others do.



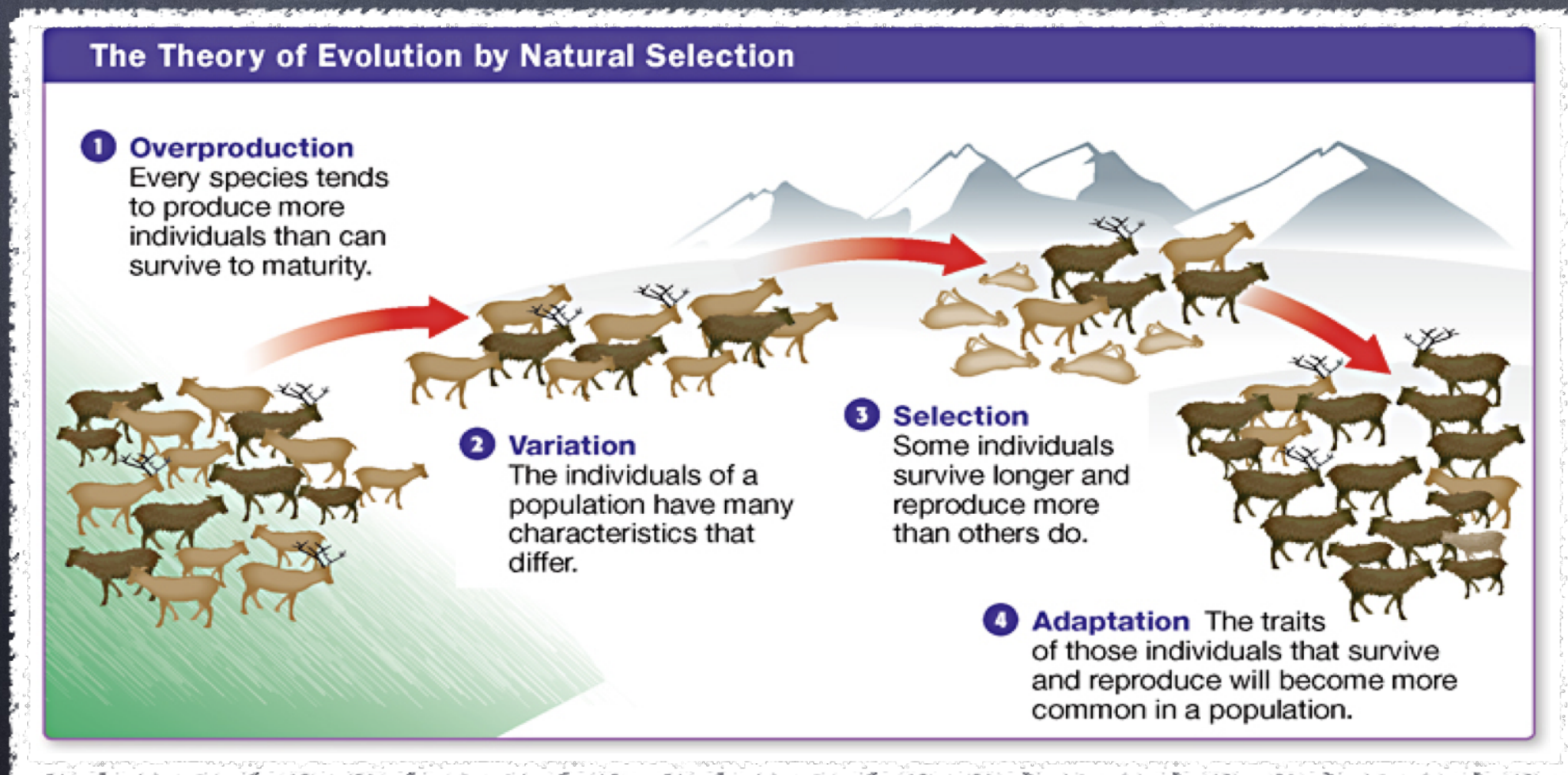
4 Adaptation The traits of those individuals that survive and reproduce will become more common in a population.

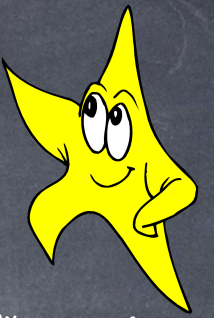


STRUGGLE TO SURVIVE



- Individuals must compete with each other in what Darwin called a "struggle for existence"
- Some variations improved survival, some reduced chance of survival





DIFFERENTIAL REPRODUCTION

- Darwin concluded that organisms with the best adaptations are most likely to survive and reproduce

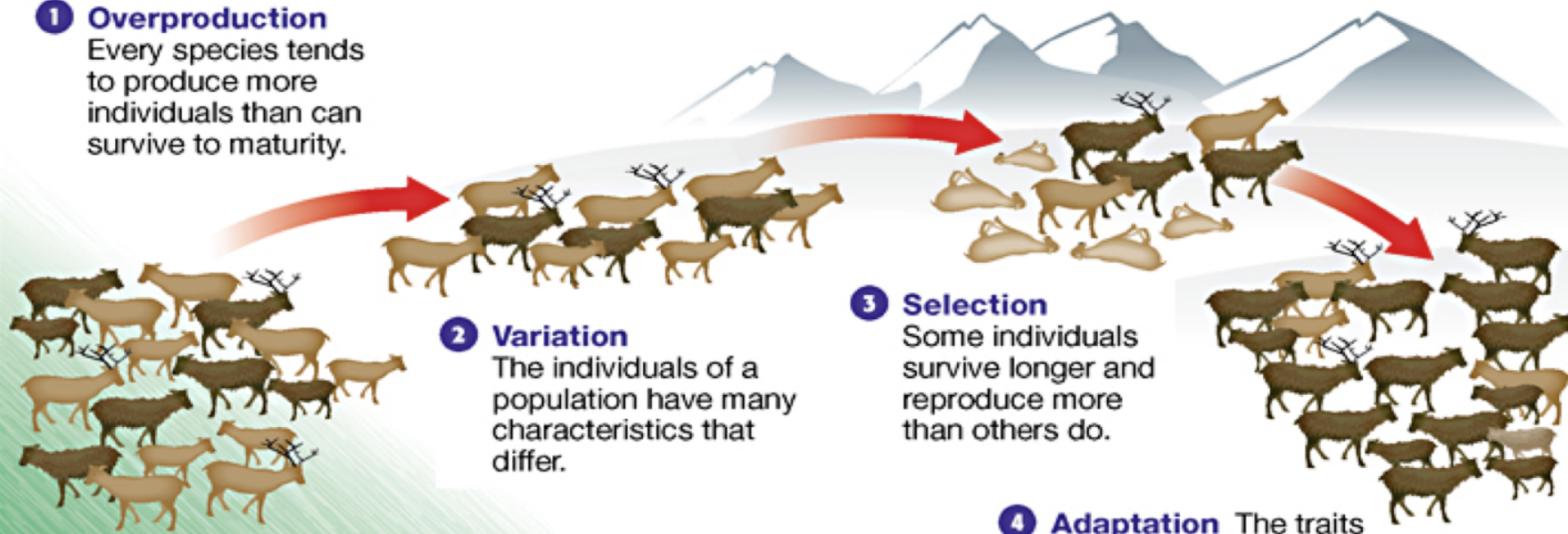
The Theory of Evolution by Natural Selection

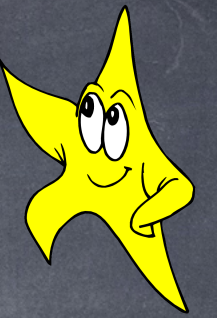
- 1 Overproduction**
Every species tends to produce more individuals than can survive to maturity.

- 2 Variation**
The individuals of a population have many characteristics that differ.

- 3 Selection**
Some individuals survive longer and reproduce more than others do.

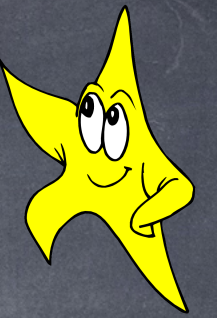
- 4 Adaptation** The traits of those individuals that survive and reproduce will become more common in a population.





ADAPTATION

- Process of becoming adapted to the environment
- Anatomical, physiological, or behavioral trait that improves an organism's ability to survive and reproduce



PROTECTIVE ADAPTATIONS

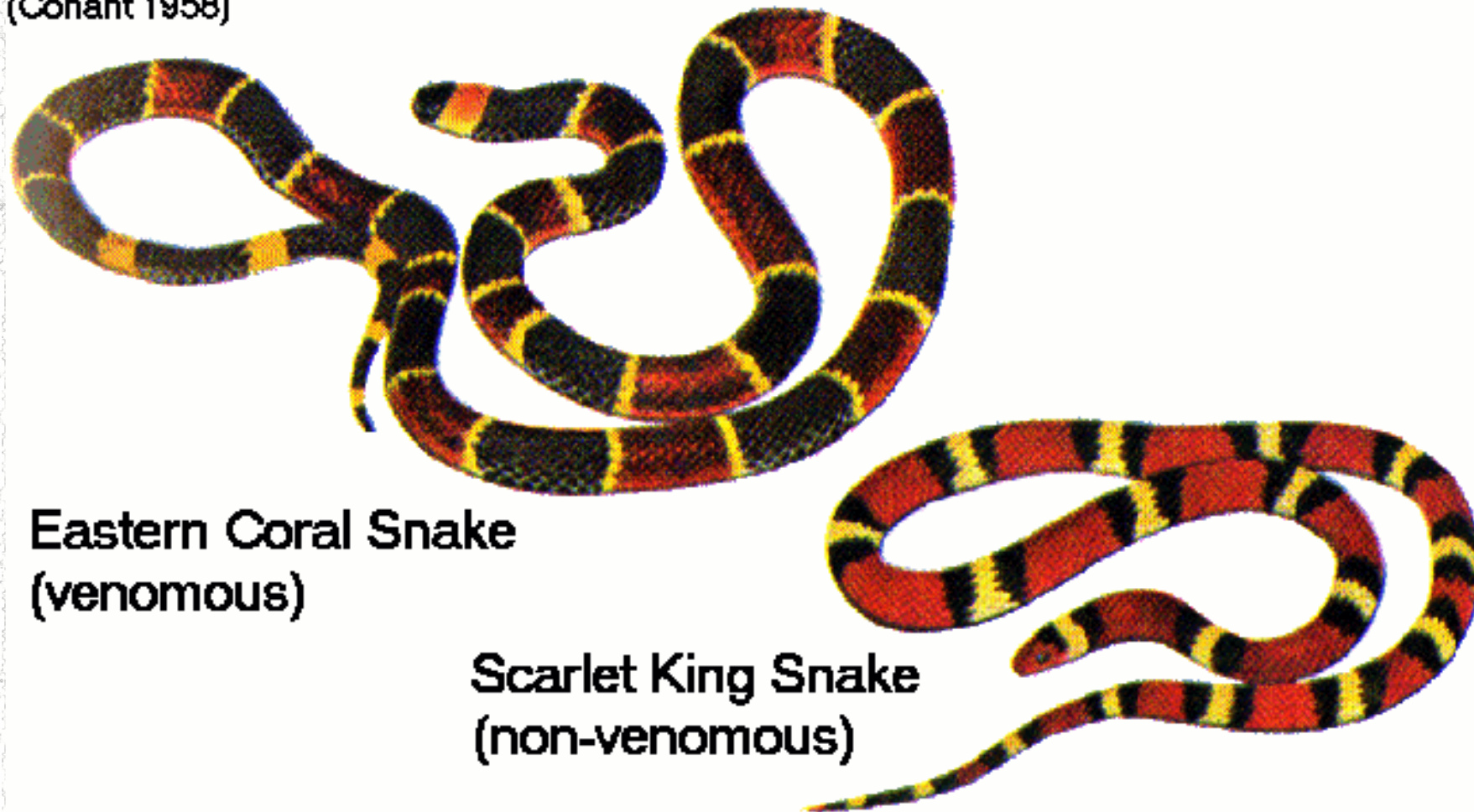
- ◉ Mimicry
- ◉ Camouflage
- ◉ Migration
- ◉ Hibernation



MIMICRY

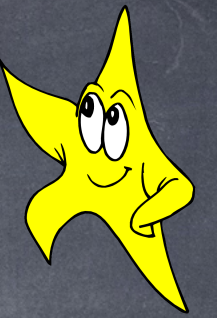
- A defense in which one organism resembles another that is dangerous or poisonous

(Conant 1958)



Eastern Coral Snake
(venomous)

Scarlet King Snake
(non-venomous)



CAMOUFLAGE

- Structural adaptation that enables species to blend with their surroundings
- Allows a species to avoid detection by predators

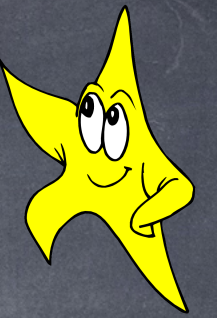


MIGRATION

- Any movement of individuals or populations from one location to another

HIBERNATION

- A period of inactivity and lowered body temperature that some animals undergo in winter as protection against cold weather and lack of food



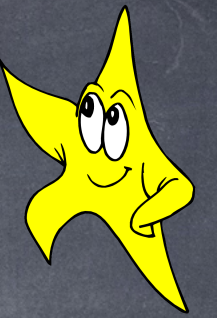
FITNESS

- Fitness is a measure of an individual's hereditary contribution to the next generation

THE FOSSIL RECORD



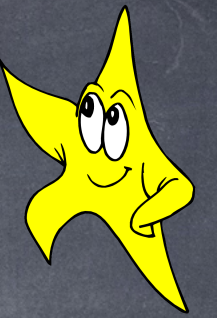
WHAT IS A FOSSIL?



- A **fossil** is the remains or traces of an organism that died long ago.



AGE OF FOSSILS

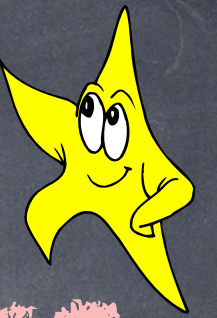


• Relative Age

- The age of an object in relation to the ages of other objects

• Absolute Age

- The numerical age of an object as established by an absolute dating process
- Radiometric Dating



TRANSITIONAL SPECIES

- Contain features that are intermediate between those of hypothesized ancestors and later descendent species



BIOGEOGRAPHY

- The study of the locations of organisms around the world

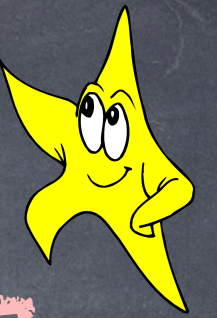
ANATOMY AND EMBRYOLOGY

- Anatomy

- Study of body structure

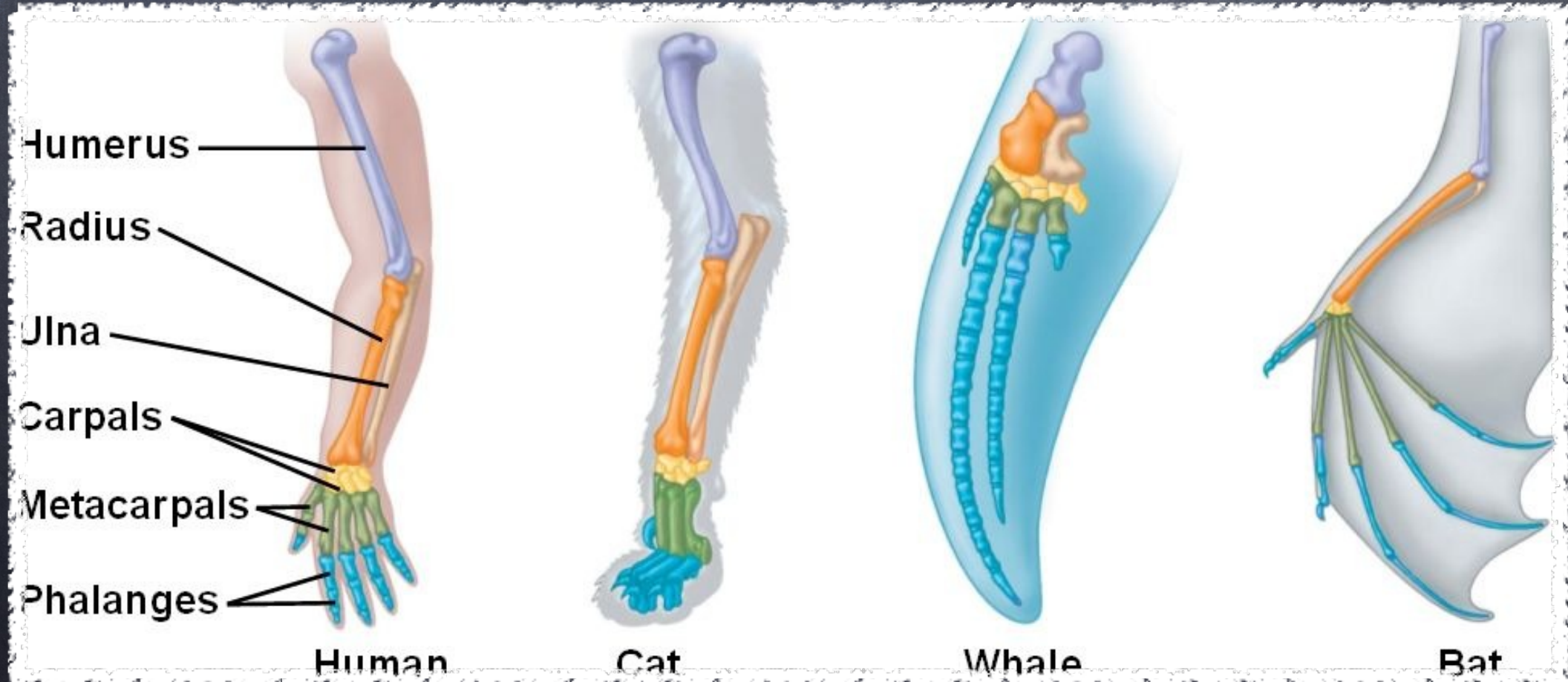
- Embryology

- Study of how organisms develop

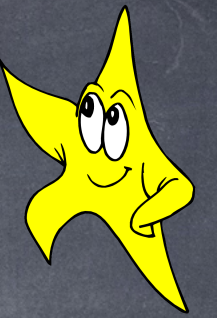


HOMOLOGOUS STRUCTURES

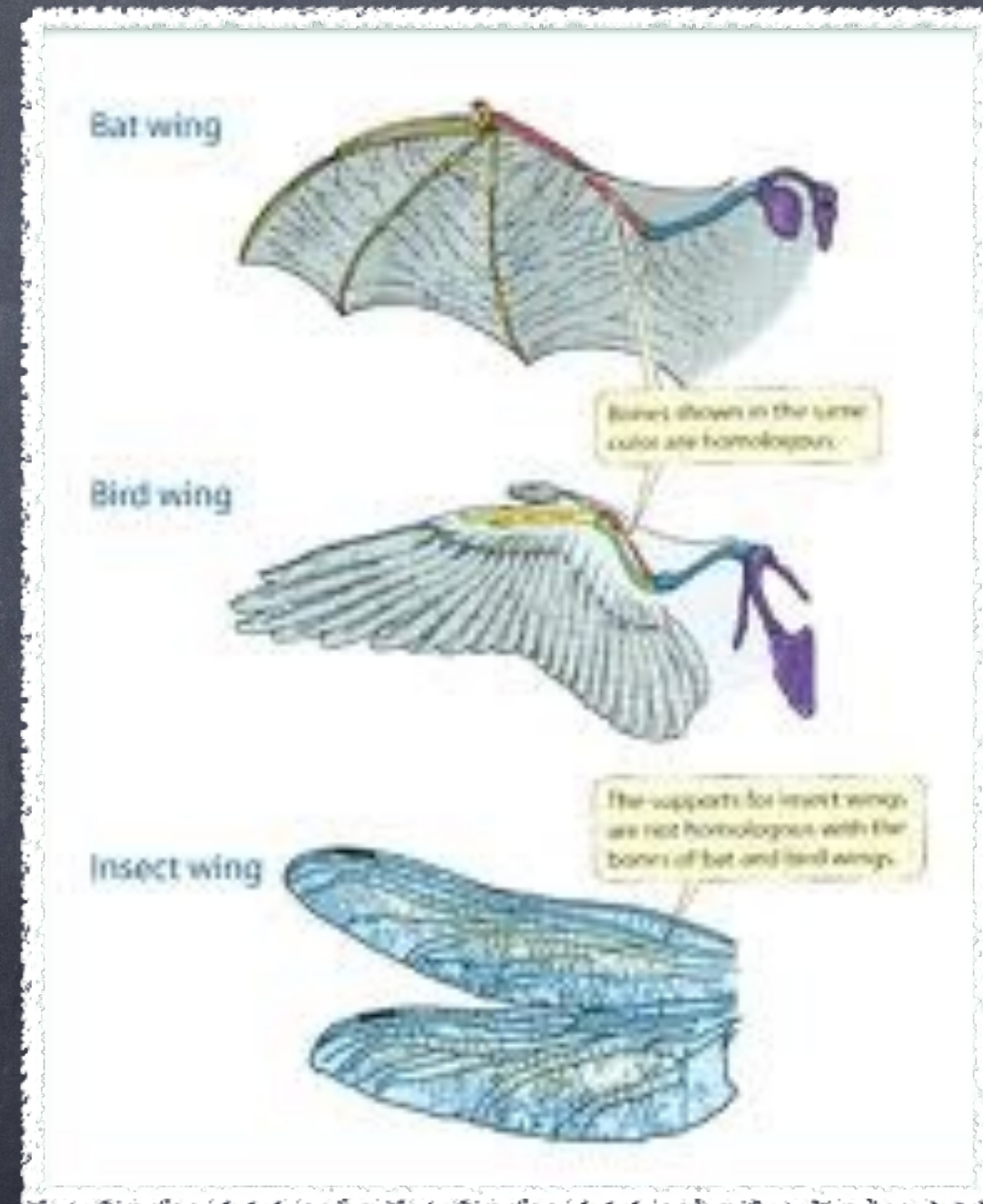
- Anatomical structures that occur in different species and that originated by heredity from a structure in most recent ancestor



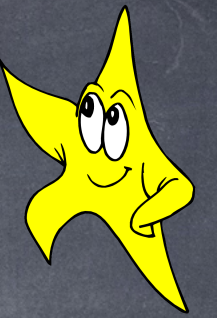
ANALOGOUS STRUCTURES



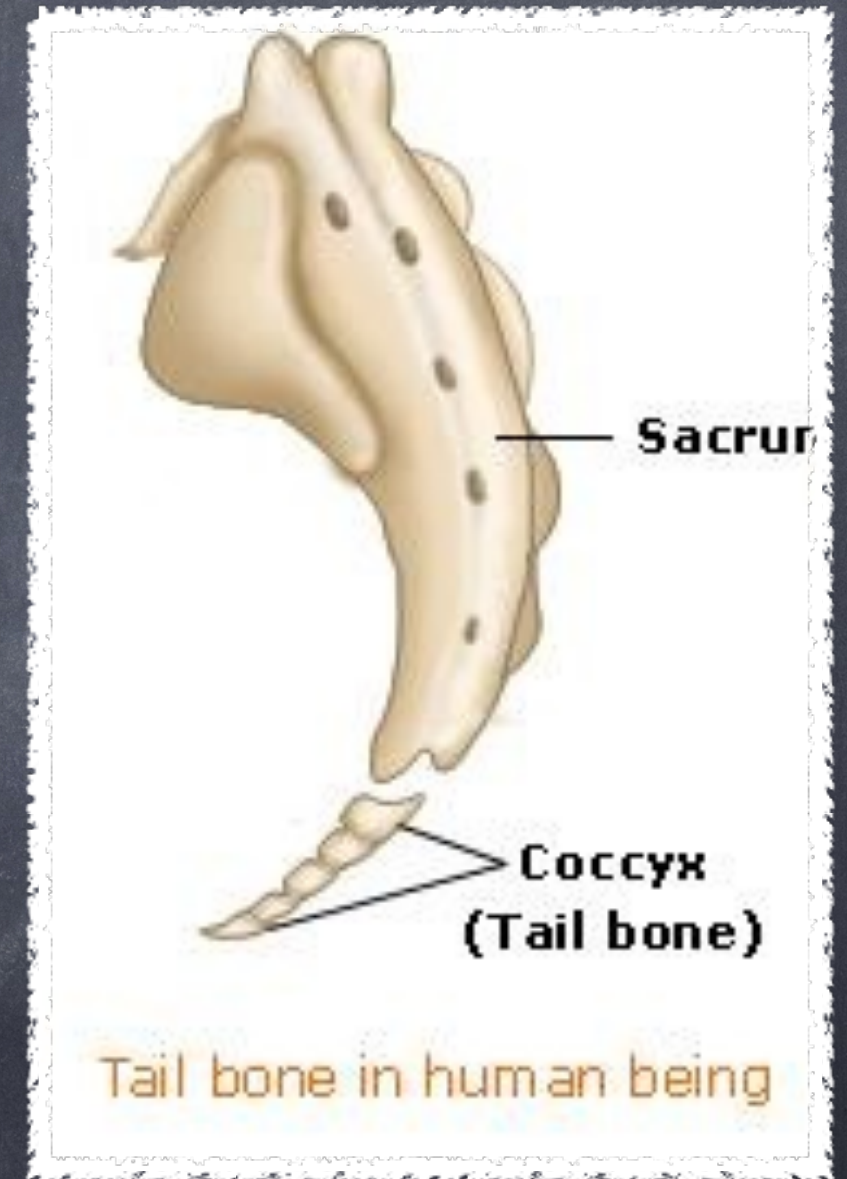
- Structures that have closely related functions but do not derive from same ancestral structure



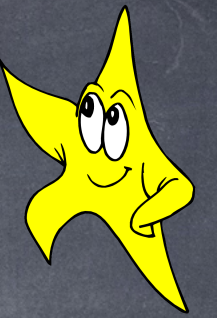
VESTIGIAL STRUCTURES



- Structures that serve no functional purpose, but resemble structures with functional role in other organisms



CONVERGENT EVOLUTION VS. DIVERGENT EVOLUTION

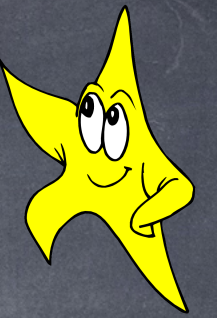


• Convergent Evolution

- Process by which different species evolve similar traits

• Divergent Evolution

- Process in which the descendants of a single ancestor diversify into species that fit different parts of the environment



ARTIFICIAL SELECTION

- Occurs when a human breeder chooses individuals that will parent the next generation

